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THE COLLEGE COURSE IN THE PSYCHOLOGY OF EDUCATION; ITS AIM, METHOD, AND SUBJECT-MATTER

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The informal discussion of "The College Course in the Psychology of Education" at the last meeting of the *Society of College Teachers of Education* centered around the following questions, which I understand the new committee is now asked to discuss in several papers that are to serve as the basis for fuller discussion at the next meeting:

I. Shall the course in the psychology of education aim to: (a) make applications of the facts and principles of psychology to education; or, (b) "interpret the conditions in education by means of certain psychological conceptions"; or, (c) derive educational theory and practice through genetic psychology; or, (d) help students to develop a point of view?

II. What methods shall be employed in teaching this subject?

III. What definite subject-matter is there which may be given in a course on the psychology of education?

IV. What relation shall the course in the psychology of education bear to: (a) the course in general psychology (shall

general psychology be required as a prerequisite?); (b) the course in methods; (c) the course in practice teaching?

V. Are the conditions such that this Society can settle upon a standard of time to be given to this subject?

VI. What shall be the character of advanced courses in the psychology of education?

The Aim.—As there is no intelligent basis for the selection of subject-matter or consideration of method until the aim, or aims, of the study have been determined, this demands attention first. It seems plain that no one of the four aims proposed in the first question is adequate. The course which aims merely at applying the known facts and principles of psychology to education must be a very thin course, for the "known facts and principles of psychology" are not numerous and those having application to education are few indeed. Furthermore, these facts and principles will not come up labeled when our pedagogy graduate gets out into the schoolroom and finds himself dealing with minds which flash out every minute a whole catalogue of tangled-up psychic facts and principles which must be carefully observed, discriminated, and classified before a poor teacher can tell which of his principles he is to apply just here. The second aim offered, if I understand what the terms used mean, seems to me still less adequate. Surely our graduates should know more psychology than can be discovered by searching out the psychological basis of the present educational practices. If well done this would surely lead to a mighty rattling among the dry bones and to the elimination of much of our present educational practice, but whence would come the knowledge and power to devise better? Our course in the psychology of education should certainly give this knowledge and develop this power. That the third aim is also too narrow, or one for which we are hardly yet ready, will, I am sure, be apparent to those of us who have tried to find material for a course in genetic psychology that would not be devoted principally to the statement and criticism of methods of genetic study, to the records of experiments which blasted fond hopes, and to others which ended nowhere or which established by questionable scientific methods the perfectly obvious. With regard to the fourth aim proposed, I would say that the courses in our medical schools, in our law schools, and our military and naval schools would be considered

sadly inadequate did they do nothing more than give a "correct point of view," and I see no reason why our courses in education should be satisfied with such an aim.

All attempts to reduce the aims of the course in the psychology of education to one aim seem to me futile. The ends to be aimed at in the course in the psychology of education seem to me to be: to get students to look upon the mind as something which always works according to definite laws; to stimulate an absorbing interest in trying to discover these laws; to give such practice in observing and interpreting mental phenomena that the graduate will daily practice accurate observation and rational interpretation when he goes into the schoolroom; to give those known facts and principles of psychology which have bearing in education and to point out this bearing through criticism (in the broad sense) of present educational practice and through practical attempts to apply these principles and facts of psychology in actual teaching under skilled supervision.

It seems a waste of time likewise to try to decide which of these aims is primary and which are subordinate. The teacher equipped with a knowledge of the facts and principles of psychology, but without training in the careful observation and rational interpretation of mental phenomena, would be as liable to err as the engineer who knew all the formulæ of mathematics and physics and mechanics, but had not been trained to set his transit level or read his scales aright. Again, the one who has a correct point of view and habit of observation and interpretation, but has not been taught the facts and principles of psychology, is as helpless as the engineer who can set his instrument and read his scales aright, but must invent all his working formulæ and tables as he goes. The student who has both the knowledge of psychology and the capacity for observation will put neither into practice if the course has not been so taught as to awaken a fondness for doing this work.

These aims, to be sure, are not necessarily in the least conflicting. In the process of acquiring the knowledge, if the course is properly taught, correct habits of observation and interpretation, the recognition of the lawfulness of mental life, and the love of searching for its laws should be gained as well. Unfortunately it is not usually so taught.

I wish to say here, by way of parenthesis, that my experience in teaching this course and my observation of other professors lead me to the belief that we need to be more on our guard that we do not fail in developing both a love for psychologizing and the power to do it accurately and rationally. Knowledge without these is vain. If these are present, knowledge may afterwards be added unto them. In our mad effort to cover the knowledge of the subject, the students are rushed along at such a rate that no time is given to gain skill through practice in personal observation and interpretation. Indeed, we often teach even the methods of gaining psychological knowledge as if these were just so many more facts to be remembered, not experiences to be undergone, and formulæ through the practice of which under our skilled supervision the students are to acquire skill. This skill is essential for the intelligent application in the schoolroom of the known facts of psychology, as well as for the discovery of new facts and the invention of new methods. I see no reason why our future leaders in this branch of applied psychology should simply sit and wait for the crumbs of educational psychology which fall by chance from the philosophical psychologist's table, as has been done in the past. The courses in the psychology of education should share with the philosophical and biological courses in educating teachers who are able to advance our knowledge of those phases of psychology which will have a bearing in education.

Method.—In the matter of method, there is first the question as to the general manner of approach of the entire subject, and after this numerous details connected with the manner of teaching various parts of the subject-matter, and accomplishing the several ends aimed at in the course.

First, shall this practical study of mental life be made through a study of the activities of isolated elements, such as memory imagination, sensation, emotion, will, with the hope that we can correct the distorted view of mental life which this causes by calling attention later to the fact that these isolated activities are really convenient fictions, things which, as a matter of fact, never exist, but which are used in teaching psychology to simplify the material to be handled? Shall we save our students, in short, from the pit we dig, by calling attention to the unity of mental life all the while we are analyzing and studying the

disjecta membra? Or, second, shall we study mental life only as a whole, studying it as a whole through the behavior of the child in relation to its environment as it grows and reacts as a whole to various situations; study the causes leading to certain characteristic activities and characteristic features of growth, the relations of successive phases of development to each other —both immediately and remotely successive—and so on, and so on?

Both of these general methods of approach have their advantages and disadvantages. The latter method is undoubtedly the more natural and, if the feet of the professor retain their contact with the earth, is less liable to mislead the student and befog his natural common sense by a set of false divisions of the mind and a confusing terminology and classification, which ought soon to be as obsolete in psychology as are pre-Darwinian classifications in botany and zoölogy. Yet he who attempts a course on this plan will find himself painfully short of material which his class can use, since nearly all the work even in genetic psychology has been done from the old psychology standpoint by men soaked in the older views, and is so reported that it is well-nigh impossible to interpret the data from the standpoint of a truly genetic and functional psychology.

He who follows the first method, on the other hand, has much interesting material to present to his class, but he will inevitably coast perilously near the maelstrom of faculty psychology, and will find it difficult to keep his students from thinking of the mind as a congeries of activities, such as memory, perception, emotion, conception, attention, will, one of which performs for itself a while according to its own laws and then goes into a far country, while first one and then another of the others comes forth and takes its exercise. These students finish the course with an awe-inspiring ability to define such acts as memory, imagination, will, and the like, and can tell all the laws governing each; but what happens when all these powers get to work at once, as they do in real life, is a question they are not well prepared to meet. Furthermore, nearly all the facts and principles of general psychology in our text-books, written to fit this plan of teaching, are those facts discovered by introspection of adults, or by experimentation and observation made upon adults. Our students who become teachers will,

however, have to deal chiefly with children. This text-book psychology giving the laws governing the several dissected mental elements which have been derived from the study of adults will give little insight into those changing phases of mental development through which the minds of children are constantly passing in the growth from ignorance and incapacity to knowledge and mental power. For example, where will your student of this course learn any of the following: at what period is memory for crude facts best; when is the altruistic impulse strongest; when does power for abstract and rational thinking begin to show itself most strongly; at what periods, or in what order, do the various mental powers ripen ready for stimulation and cultivation; what are the periods of peculiar mental stress, weakness, and danger—as, for instance, the time of danger from scepticism, or morbid religiosity, or perverted sexuality, or certain tendencies to cruelty, to dishonesty, and the like; what are the developmental relations between the different characteristic periods of mental development—as, for instance, between early sentimental love of nature and the later cold-blooded, scientific, purely rational attitude of mind; between the early superstitious anthropomorphism and later higher spirituality; between the lawless use of the imagination in fairy tale or folklore, and the later interest in real life and ability to abide strictly by the facts; and so on, and so on? In all of these lines, and on all similar highly important questions, our text-book psychology of education and the method of studying solely the *disjecta membra* of the adult mind are footless and must ever remain so.

If each of these methods alone is so inadequate or misleading, the question arises at once whether we do not need to employ both, hoping that the accumulated psychological knowledge of the race gained by the old method of study will serve to fill out the deficiencies in the results obtained by the newer method, and that the study by the newer method may, on the other hand, serve to correct the misconceptions well-nigh inevitable in the use of the older method. This seems the rational conclusion in the present state of development of the science of psychology.

If study must be made by both of these general methods, we have now to determine which shall be employed first. If we possessed more connected, complete and reliable subject-matter

for the course from the genetic and functional standpoint, this would seem the natural approach, but this we have not yet obtained, nor are we in possession of any but the crudest methods of teaching what is known. Furthermore, this would make it necessary for us to begin our course in the psychology of education with a study of the mental activity of children, since practically all study of the mental life of adults has been done by the older method of analysis and study of the *disjecta membra*. To begin the study of the psychology of education with a study of child psychology would in our opinion be a mistake. While it is, after all, a knowledge of the minds of children which the teacher most of all needs, and while a large part of modern pedagogical nonsense has arisen from the stupid application to school children of facts of psychology gotten through the introspection of adults, it still seems imperative that we begin the study of educational psychology with the introspective study of the activity of the adult mind. This arises out of the simple psychological law that the human mind can proceed to the unknown only through the known. The student of the psychology of childhood must develop some sort of apperceptive organ for the observation and interpretation of the mental phenomena of childhood before he can profitably undertake such study. The adult mind is nearer to the student than is the child mind. The student has a mental life going on within him, through the observation of which the abstract discussions of the text and the professor can be given concreteness and can be understood. All facts of psychology must ultimately get their meaning through introspection and comparison with the only mental life of which we have any immediate experience; *i. e.*, our own. If the student has not cleared up his hazy notions of his own daily mental activity, and gotten practice in the handling of non-physical phenomena, I cannot see how he can study intelligently the mental phenomena of childhood, of which he has, to serve as apperceptive material, only dim and most unreliable memories. Having once obtained facility in observation, in analysis, in the general handling and interpretation of the facts of his own present mental life, he is then better prepared to call up, sift and handle the memories of his own childhood, and through these to work out to the study of the facts of child psychology in general.

We would conclude then that the study should begin with the study of the adult mind, and perforce with study of the results obtained by the old method, since practically no studies of the adult mind have been made by the newer method. However, let us not forget that this is merely the place to begin. To stop here would be disastrous. It seems hardly necessary to add that this order of procedure does not mean that we must first teach all that is known of the psychology of adults as far as it applies to education and then proceed to teach what is known of child psychology. Even in the study of a single topic, such as instinct, as given in an ordinary text on psychology, it is often necessary, after getting all possible light from introspection, to go back to the facts of childhood or even of animal life, and forward to the phenomena of mental decay, in order to gain clear insight. In each case, however, introspection must precede. And finally, after all such studies of fragments of the mind are made as best they may be, we should close the course with such a consideration of mental life as will reawaken and instruct the sane common sense of the student by a study of the operations of the mind as a whole (especially the child mind) as it reacts to this and that natural or artificial stimulus in life —stimuli from within, and stimuli from without.

In brief, then, we would begin our first year's course in the psychology of education with introspection and analysis, and would, not from choice but for the reasons given above, take a survey of those facts and principles of psychology bearing on education which have been obtained by the study of the dismembered parts of the mind, starting always from the study of the student's own adult mental life and working out where possible to children's mental life. As a corrective for the utter inadequacy of such a course, and for misconceptions of mental life almost sure to result from this kind of study, we would follow this for one term by a study of the mind as a whole, watching its growth and reactions to the varied stimuli of life.

With the aims and general method of approach determined, there remain for consideration the detailed methods to be employed from day to day in accomplishing these aims. As the success of any particular method is so largely dependent upon the personality of the teacher, I feel great hesitancy in saying anything on this point. I can only say that I personally seem

to have accomplished most when pursuing the following plan. Each student is required to use some text in preparing for recitation. The recitation hour is largely devoted to free and easy Socratic discussion, with a view to helping the students to introspect, to clear up for themselves their own thinking, and to discover for themselves either what are the psychological problems involved in certain educational practices or to find the bearing in education of the facts of psychology given in the text or in my class lectures. The hour is never dawdled away in an oral quiz on the text, nor are the students given hour-long lectures by the professor. The lectures would play a much smaller part than they do but for the absence of any text which contains anything like a complete collection of those facts and principles of psychology which have bearing upon the problems of education. At times, points are left at a stage of confusion to which I have purposely brought them by the discussion, and the students are required to complete the thinking and hand in the result as a written exercise at the next recitation. The students are also often required, after learning a new fact or principle of psychology in class, to write for the next lesson a paper stating the possible applications of this fact or principle in teaching, and giving concrete instances of its violation and of its application in the actual teaching which has come under their notice during the two days intervening.[1]

The absence of a practice school here prevents our requiring students to actually prepare and attempt to teach lessons in accordance with the psychological principles under discussion at the time. This is, in my opinion, the place for correlation of the practice course with the psychology of education course.

During the fall term we require, in addition to the three recitations, one two-hour period of laboratory work per week. Notwithstanding the fact that my friends among the experi-

[1] I may add here that it was through these reports that I learned of the well-nigh universal misconceptions which arise from a study of separate mental powers. The student becomes so anxious not to have violated some principle of memory or association, for instance, that he will criticise an act of a teacher which may have been an excellent process for developing reasoning power or awakening an interest—this being the purpose of the teacher at the time. Or the student's infatuation for the law of neural habit may blind him utterly to the baldest facts of instinct or of will, which are operating all at the same time.

mental psychologists will hold up their hands in horror at a twelve-period course in laboratory work, experience convinces me that it clears up far more obscurities and misconceptions than it causes and, if properly given, is a very valuable part of the course. The students accomplish the following things:

1. By dissection of a sheep's brain and by study of models, charts, sections, photographs, and lantern slides, a general notion is obtained of the gross anatomy of the brain and of the microscopic elements; also some idea of how impulses are conducted, how reflexes operate, and of the probable physical accompaniment of mental operations.

2. One sense organ is studied as a type.

3. The meanings of such terms as subliminal, threshold, specific energy, after-image, relativity of sensation, are learned by actual experience.

4. The process of perception is carefully analyzed by experiments with illusions.

5. The actual use of the plethysmograph and chronoscope is observed, and in some cases learned.

The plethysmograph is used to impress upon the students the intimate relation between mind and body. The study of illusions and of reaction times is used to help them realize that mental life may at least in some phases be studied by definite and accurate experimental methods. I have been especially anxious to supplement this by certain experimental work in memory, in attention, and in emotion, paralleling the discussion of these topics in class, but the limited time at the students' disposal prevents this.

During the winter term the laboratory work is dropped and each student is required to undertake privately a piece of individual study in the psychology of education. The student selects his own topic (topics are suggested from day to day in class discussion), and with the aid of the professor finds literature on it. After reading widely for two months he presents the results of the reading in an essay. This plan at least enables the students to get a great deal of work out of the professor. It also gives the professor an excellent chance to find what is in a student and where he stands mentally. While a few dodge the work and fail, the vast majority do a surprising amount of reading and, in their compilation and criticism, exercise more

thought than would be required to pass quizzes on an extra text-book. Many students consult repeatedly with the professor about this work; each must consult with him twice, once to get suggestions about literature and the general plan of study, and once after full reading to present for consideration the outline of the plan upon which he proposes to write his essay. That the object of this is to teach the student to lean upon himself, and to teach him how to use literature in the study of other psychological topics, is too obvious to need mention. That it accomplishes this more often than it can be accomplished in any other way seems to me amply borne out in seven years' experience with this practice.

I wish to again state that not the dimmest thought is entertained that the devices above enumerated constitute the only correct, or even the best, method of teaching this work. Under the burden of very large classes and very numerous outside duties, and the handicap of limited library facilities and no practice school, it seems to be the best this particular teacher has been able to devise. (I understand that these articles which we write are to be in part a general confession of individual sins as well as a discussion of broad principles.) The most serious objection to this plan is that the individual conferences and the careful correction of the numerous papers handed in involve an immense amount of work on the part of the instructor. Not to correct and return the papers and not to discuss general types of error and of excellence in class afterward is to destroy the value of the method. To put this work off entirely on student-assistants and fellows is likewise to prevent the possibility of accomplishing that which is one of the chief aims of such work; *i. e.*, to find out for yourself just where your students are in their mental progress. Furthermore, I find that not one assistant in three does this work well, and I may add that the assistants here are about as capable a set as I have met anywhere. It is also objected that this method requires too much work of the student, who is supposed to devote only nine hours a week to a course, including lecture and laboratory periods. During the first year that this method was pursued there was much complaint of overwork—the professor was even waited on by the Dean of Women in behalf of the burdened girls. There has been little or no complaint, however, since the instructor became a little more familiar with the

course himself and since the students have gotten over the notion that the study of the psychology of education means the memorizing of a set of beautiful ready-made universally applicable principles of teaching which, after being memorized, can be applied like Munyon's specifics by anybody and in any kind of situation.

It seems hardly worth while to discuss the methods of teaching the last third of this course, which deals with mental life as a whole, since the method must vary according to the size of the class, the library facilities at hand, and the particular topics thought worthy of study. These topics constantly change as newer and better studies appear. The statement about subject-matter, made later, will indicate the general method.

Subject-Matter.—An effort is first made to give an intelligible statement of the different ways in which psychology has been studied. The introspective, the physiological, the abnormal, the animal, and the child psychology each receives brief notice, and the peculiar advantages and the limitations of each field and each method are illustrated in one or more concrete instances: for example, the use of introspection in the study of perception —its limitations in the study of emotions and of the relation between mind and body; the light thrown on the personality, the memory, and the emotions by abnormal psychology; the clearer views in instinct coming from the study of animal psychology; the new knowledge of the nature of mental growth gained from child psychology.

After this introduction a concrete piece of mental life in the shape of a revery is put before the class, with the request that they discover why the mind kept moving and why it moved in the particular order in which it did. All of the so-called laws of association are invariably quickly found by the class. It is frequently not so easy to show that all the associations are due to the working of the one simple law that "when two or more ideas have been in mind together, upon the recurrence of one of them the other, or others, tend to come with it." The class next looks for the determining factors which cause one rather than another of possible associations to rise at a particular time. This brings us to memory, which is then analyzed and a rational basis gained for judging the validity of methods of study which may develop or injure it. The following questions

are of interest here, and upon each we have definite results from careful experimentation: How may memory be improved? Does increased power of memory gained in one field of work give increase in all fields? Is memory a faculty? Should similar sets of memories be acquired at the same time, or one set first thoroughly mastered before the other is begun? What is the best plan for memorizing disconnected facts; logically related facts? At what period of development is memory best for disconnected facts; for logically connected material? How much is memory aided by presentation through several senses instead of one?

The study of memory drags in imagination, the analysis of which carries us into perception. Introspection is practised by the class here and soon makes manifest the wide differences in types of images habitually used by different people. Appeal is made to abnormal psychology to settle the question of the creative (*ex nihilo*) power of the imagination. In discussing the training of the imagination and its relation to other powers we pass into perception. Here the analysis of an act of perception takes us back, on the one hand, through association, memory, and imagination, and leads, on the other hand, into sensation. An example in the study of perception affords the best opportunity for illustrating the greater accuracy and clearness which the laboratory experiment makes possible. Most students will when asked, for instance, why they perceive you as standing at the board, state that they perceive you there because you are there—intimating in general that things are perceived as such because they are such. Now rotate before the class a disk with a spiral drawn upon it and stop the disk suddenly. When they then see the spiral apparently go in the opposite direction while the disk is motionless, they must admit that we do not see a thing as such merely because it is such, for a motionless thing is perceived here as if in motion. Then what makes us perceive things as we do? Rotate now a disk painted so as to produce alternate rings of gray and blue. At once they see that the gray becomes yellowish. Rotate the same gray ring with surroundings in turn of green, of red, of yellow; each time the color of the gray will seem different. In this way will be discovered one thing which modifies our perceptions, namely, the surrounding objects. In the same definite concrete way the

influence of the immediately preceding perception can be shown, and then the fact that ideas received years ago often join with present sensations in creating the perception of a very simple thing. Here we have apperception already explained, and the time used in the experimental demonstrations well spent in illustrating one important method of psychological study and in impressing upon the students the truth of perception in a way which they do not so soon forget as they do mere words.

The study of perception brings in the new element of sensation, which now demands study. Here there is comparatively little of value for teachers. The creative nature of the sense process is made manifest. The fact is pointed out that our organism is capable of responding to very few of the myriad vibrations which probably surround us. The selective nature of our physiological mechanism and of our consciousness is brought out, and the laws of sensation are experimentally demonstrated—the law of the threshold, that of subliminal stimuli and summation of stimuli, of specific energy of nerves, of relativity and fusion of sensations. After this general survey the sense of sight is treated somewhat fully as a type.

This study of sensations and sense organs leads inevitably, if the students have any life at all, into questions about the structure of the brain. With the aid of slides and microscopes, models, and charts, a teacher can in two or three two-hour periods give all that the average student needs in order to understand the reflex and volitional mechanism, and to get some idea of the physical basis of association, memory, and the like. This is followed by a lesson on localization of function in the brain, and the study of so much of the gross anatomy as can be gotten by the dissection of a sheep's brain during two periods of laboratory work.

Just what is best to take up next has often puzzled me, but generally I find that the study of localization leads into discussion of nervous functioning in general. The inherited unlearned reactions are mentioned here, though not fully treated till instinct is studied. The three methods which the organism has of acquiring new reactions should certainly be impressed upon the students; namely, first, by the selection and repetition of chance successful reactions; second, by imitation; third, by volitional response to an idea. It is very important that the

young teacher appreciate fully how very differently different things must be acquired by children.

General nervous function leads into a study of the physiology of habit, which in turn brings up the psychology of habit. Here the teacher has interest in several practical questions which psychology can settle. What is the easiest method of establishing a new habit? How best break an old one? When should processes be reduced to habit and when not? What is the effect of habit upon the will and character (here brief study of reformatory methods and criminal psychology is helpful)? What are the usual and most probable habits both good and bad to be expected, or to be established, or to be broken, at different ages?

This last question leads into a study of instinct. Here is a field the importance of which for education is just beginning to be appreciated. I have found no other subject more interesting to my classes, and certainly no chapter in psychology has more profound bearing upon education. Animal and child psychology have here worked a revolution. The earnest student wants to know about many things in this field. How did instincts originate? What is the relation of instinct to intelligence? Does man have instincts? What are these instinctive tendencies in man? At what age is each of his instincts, good or bad, most likely to crop out? What conditions favor and what repress each? Which of these instinctive tendencies are necessarily transitory? Which may become fixed? What fixes an instinct? What stimulates it? What checks it? Which of the early instincts prepare the way for later good instincts or hold down bad ones? Which of the later instincts check off early bad ones? and so on indefinitely.

Instincts involve emotions, and the student now wants to know the causes which produce emotions. This is one chapter of psychology in which a comparison by the class of the views of several authors seems to me to be valuable. First, the general view that emotions result from ideas; second, James's claim that they result from bodily conditions; third, Herbart's theory that they result solely from the conflict or harmony of the ideas in mind. Each of these has something of truth, and, when properly understood, some suggestions for education. The usual cataloguing and describing of emotions is useless for

teachers, but one of the emotions deserves especial study, *i. e.*, the emotion of *interest*. What are children's natural interests at different ages? What purpose in life does each of these serve? How is a new interest aroused, how checked? What is the effect upon the character of studying always along lines of interest, and the effect of the opposite process of ignoring or crushing interests? These are a few of the questions in this line which psychology can and should answer.

An appreciation of the enormity of my offense in making this paper so lengthy leads me to omit all further details and say that in the study of imitation and suggestion, of attention, of discrimination, conception, reason, personality, and will, there is ample material to fill out a course in the psychology of education, every part of which makes clear the right or wrong of certain educational practices.

The writer has not found it possible as yet to give a closely knit and logically developed course in genetic psychology, viewing in an orderly way the growth and activity of the mind as a whole, since the studies yet made have yielded only a few definite results of value, and since these studies have been made here and there without any coördination or definite plan. Notwithstanding this, there are so many helpful and hopeful suggestions for teachers in these scattering studies that they are well worthy of the student's attention both because of the subject-matter contained and because of the value of this kind of study as a corrective for the two terms of old line psychology.

We believe that this part of the course begins best with a study of the laws of growth, starting with bodily growth and working through a study of the growth of the nervous system up to the study of mental growth. Consideration is given to such topics as the following: the periodicity of growth; the inner and outer factors in growth and their relative effect; development from fundamental to accessory; Jackson's three-level theory of nervous development; vestigial organs; nascent periods; retardation periods; the relation of special to general development; an outline of characteristic features of infancy, childhood, pubescence and adolescence; the developmental (non-mathematical) relation between different phases of growth. In each topic the known facts on the physical side are given, after which the principle found to govern here is tested in the

light of the known facts of corresponding processes in mental life.

The general character of the subject-matter can be seen by consulting such works as Donaldson's *Growth of the Brain*, Burk's articles entitled *Growth* and *From Fundamental to Accessory in the Development of the Nervous System*, the articles of Bryan and Harter on *Learning the Telegraphic Language*, several of Thorndike's books and papers, numerous papers by Dr. Hall and his students, including my own article entitled *The Philosophy of Education*.

This study of growth should be followed by a study of the laws governing fatigue and arrest of development. This important part of the course is with me at present in a sad way because my own studies of fatigue have convinced me that all of our methods of studying fatigue are so inaccurate as to make the results to date either worthless or misleading. We are also in great need of more and better studies of the symptoms and causes of arrest of development.

These general studies serve to give the student the right point of view and right attitude of mind towards the mental growth and development of children. After this is gained, the remainder of the term is spent in studying the results of the investigations which have been made of special groups of reactions, or tendencies to react. Students have shown much intelligent interest in the following topics, and there is enough reliable subject-matter available on each to make the study worthy of serious consideration. Imitation and suggestion; play tendencies, their relation to serious activities and to general development; the development of reactions towards language and literature, towards nature, towards art, towards social life, towards restraint, authority and law, towards moral considerations, towards religious beliefs and ceremonies. It hardly need be said that all of these and all of the above-mentioned general topics cannot be treated in one term. Just what to omit is each year a difficult question which is usually settled on purely practical and local considerations, and hence need not be mentioned here.

This course should include (preferably somewhere near the end) a study of the limitations, the inaccuracies, and the real value of each of the methods now employed in the study of the

mental development of children. The individual studies of Darwin, Preyer, Shinn, Baldwin, and others; the practical method of Warner; the loose questionnaire method of Hall, Sully, and others, aimed primarily at qualitative results; and the rigid mathematico-statistical method of Galton, Thorndike, and others has each peculiar value which should be pointed out. The same is true of the approaches made by Donaldson, Loeb, and others from the neurological side; by Oppenheim from the medical side; by Chamberlain from the side of Anthropology; by Seguin, Howe, Clouston, Kraepelin, and others from their special fields. This part of the course should make it possible for the student who completes it to evaluate properly the results which have been attained by these different methods of study, and possibly in time to originate better methods. If not so much as this can be accomplished, then at least it should enable the next generation of developmental psychologists to escape the more virulent form of the questionnaire epidemic without lapsing into questionnairephobia or mathematico-statistico-mania.

The Relation of the Course in the Psychology of Education to other Courses.—(a) My experience and my information gained through inquiry lead me to believe that a course in philosophical psychology should not be made a prerequisite for educational psychology. The problems discussed and the methods used in teaching are so different in the two courses that the one is not only not necessary as a prerequisite for the other, but is of little more special use for this purpose than a course in general biology. In fact, I am of the opinion that the more practical educational psychology is the best possible introduction to the subject of psychology and almost a prerequisite to the intelligent study of philosophical psychology as now universally taught.

(b) When our courses in the psychology of education are what they should be, I hardly see what there is left to give in a course in general method. All special method courses should have the psychology as a prerequisite.

(c) This is answered on page 9.

Advanced Courses in the Psychology of Education.—The advanced work in the psychology of education should be granted only to those who, after completing the preliminary course, have pursued seriously courses in general psychology, philosophy, and biology in such a way as to equip themselves for investigation.

For such students there is a most attractive field of work, either in the further study and investigation of the psychological processes involved in the old and in newly devised educational practices, or in the investigation of those problems in psychology the solution of which will throw further light upon the processes of teaching and of education in general.

WHAT INSTRUCTION IN EDUCATIONAL PSYCHOLOGY SHOULD BE GIVEN IN A PROFESSIONAL COURSE FOR TEACHERS?

By EDWARD L. THORNDIKE, Professor of Educational Psychology, Teachers College

Sooner or later we shall learn what training is desirable for teachers by experimenting with various courses and keeping track of the results. Our present hit-or-miss methods of following individual opinions or traditional practices will give way to the rational selection of the proved best. But at present we can only decide what is likely to be best on general principles.

These advise us to give an accurate, scientific course, such as would be acceptable to experts in psychology; one that will also train students to interpret the facts of school life logically and scientifically; and, in the third place, one that will give the greatest possible amount of information of direct value in increasing the teacher's efficiency. These three aims would, of course, be so adjusted in case of conflicts between them as to maintain a wise balance.

The success of a course in educational psychology depends to a large extent upon the course in general psychology which precedes or accompanies it. This is too often only an elaborate series of descriptions and arbitrary definitions plus much or little inaccurate brain anatomy, descriptions of child life, or amateurish philosophy. The respectable general courses fall into three groups: those demanding analytic and reflective study as a propædeutic to future courses in philosophy; those rich in the empirical psychology of sensations and the percepts; those attempting to describe and explain mental life in general. Courses of the first sort unfortunately emphasize just those methods of study, and courses of the second sort those data, which the prospective teacher does *not* need. The second sort are preferable because they at least do not weaken the sense of fact. Courses of the third type, though the best now available, are hard to administer. The topics are too many; useful experiments have not been devised; definite exercises for students such as we have in books on algebra or physics are lacking; there is little unity apparent in the science; for instance, what

the student learns about the brain he rarely hears of afterward. The books of this sort remind one of the older geographies, in which we first learned all about the New England States, then all about New York, and so on, no apprehension of any general geographical laws ever resulting.

It would appear wise in adapting a general course to the needs of teachers to give much less attention to the gross anatomy of the nervous system, including the organs of sense, to the processes involved in the perception of the external world, and to the psychology of any special feelings, such as of self. These three topics take up much of the student's time with little profit. The gross anatomy of the brain has little meaning except for the surgeon; sensation and perception are much less important to the teacher than habit, the association of ideas, or the process of discrimination by varying concomitants; the elaborate description of our feelings of self, time, recollection, rhythm, distance, and a dozen other special feelings, are all together much less important to the teacher than a few plain facts about individual differences.

Much more attention should be given to dynamic psychology than the present custom allows. At least one third and perhaps one half of the general course should deal with the connections between outside events and mental states, between outside events and acts, between one mental state and another, and between mental states and acts. Instincts and capacities, habits, the share of previous experience in perception, the association of ideas, the abstraction of elements, ideo-motor action, and inhibition should be leading topics in a psychology for teachers.

Students who have thus learned the elements of psychology could take profitably any one of several distinct lines of work, each of which could be and has been called educational psychology.

(1) A course fashioned after the old applied psychologies, but possessed of truer facts, is a useful one. What Bain did in his *Science of Education* with the psychology of his day, we may do in an Educational or Applied Psychology with our increased knowledge and from our new points of view.

(2) A course of more detailed study of special topics, such as attention, types of imagery, the association of ideas, induc-

tive and deductive reasoning, the psychology of reading, fatigue, the influence of the bodily expression of mental states and the like, is also a useful one.

(3) A course in the psychology of childhood with special attention to the behavior of children as learners and to the relation between their behavior and general psychological laws may often be as helpful as either the first or the second course.

The writer's own belief and practice is in favor of (4) a course somewhat evenly divided between (a) the psychological basis of general educational theory, (b) the psychological basis of teaching in the narrow sense, and (c) the special psychology of childhood and adolescence. The topics under (a) may be: the share of original nature in determining intellect and character, the influence of the environment in originating and selecting mental variations, the influence of special training on general abilities. The topics under (b) may be: teaching as the art of providing stimuli to desirable reactions; the conditions favoring the reception of stimuli; their control; means of securing attention, memory, comprehension, and appreciation; fruitful inductions and deductions; the value of analysis, comparison, expression, application, and correlation; the conditions requisite to habit formation; suggestion and imitation; incentives and deterrents; the control of the emotions; mental hygiene. The topics under (c) may be chosen from a wide range, but with regard to the fact that, other things being equal, the facts of later childhood and adolescence will be worth more to the teacher than those of infancy.

Any one of these courses can be made to fulfill the three aims suggested in the second paragraph of this article. The first would probably be the hardest to make satisfactory to the scientific psychologist; the second would provide least direct practical information to the teacher; the third would run the risk of giving too little training in applying psychology to teaching and of being unscientific; the fourth has the advantages and the disadvantages of a wide range.

In the administration of any course we are hampered by the lack of adequate text-books. I confess to having read but few of the applied psychologies and books on general method. They are too irritating to the sense of fact and of logic. So far as I know them, they are either weak dilutions of Bain flavored with

misunderstood doctrines from modern psychology, or one-sided applications of an unreal logic. At Teachers College we let the student make his own applied psychology, guiding him by a set of questions and suggestions.[1] The authoritative book will sometime come.

The literature dealing with the special psychological topics which may properly make up an advanced course for teachers is scattered, not very teachable, and either too hard or too inaccurate. The literature of child study has improved greatly within recent years, and by selecting wisely from three or four text-books, material fit for systematic study is now obtainable. All such books (including my own *Notes on Child Study*) are lacking in scientific rigor and are not sufficiently systematic. Suitable books on the psychological basis of general educational theory are the hardest of all to find. The educational theorists are hopelessly vague; the accurate knowledge of the topics is stored up in books or memoirs which are far too difficult for our students. The instructor is forced to organize the material himself and to lecture.

In presenting the subject-matter for any one of these four courses our besetting sin is vagueness. "You must be clear to gain attention," we teach, but, *just how* to be clear is what the student needs to know. "The teacher must fit the stimuli he presents to the individual differences of his class," but *just what amount* of individual differences to expect in a class or *just how* the same lesson is to be modified so as to profit the dull and the bright, the abstract and the concrete thinkers, is the main practical problem. It is no great insight to learn that heredity plays a great part in mental achievement: just in what directions and in what amount, are the questions the answers to which will modify our educational practices. We need to feel an utter abhorrence of vague recommendations which mean so much that they mean nothing, and to search the four quarters of psychology for definite facts that give positive guidance in the actual situations of school life.

So much for the subject-matter of a course in educational psychology. Concerning the methods of teaching such a course, I have somewhat more decided opinions.

[1] See the syllabus of Education 3 printed in the TEACHERS COLLEGE RECORD, September, 1901.

First: to take the student's time for hours to scribble down notes is well-nigh criminal. What a student is expected to learn should be given to him in a convenient form for study, namely, in print. That we waste his time and ours in lecturing is due either to the fact that we are too lazy to write out and print our lectures, or are ashamed of them, or are afraid that, deprived of our lectures, we should really have to teach the class.

Second: to assign tasks in required reading without having at least one copy of the book in question for every ten students in the class is cruelty.[1] The money spent in duplicates will be saved twenty times over in the time required to find and secure the books.

Third: definite exercises which force the student to test his knowledge and enable the instructor to distinguish between verbal and real knowledge are a prime necessity. Consider what our arithmetic and algebra books would be if they contained no examples; what the teaching of Latin would be if there were no Latin composition or translation; what instruction in rhetoric was before the days of theme writing! We have gotten on so long in psychology, economics, sociology, and the other mental sciences with only the presentation and discussion of principles that we fail to realize the essential inferiority of such teaching.

Fourth: there should be observational and experimental work enough to connect the principles taught with the realities of life and to establish the habit of actually examining mental facts and verifying psychological laws. These experiments should be so devised or chosen that they will involve a minimum of knowledge of apparatus and produce a maximum of knowledge of fact. They should be interpretable without ambiguity and by fairly easy inferences.

Fifth: the reading of reports on special topics by individual members of the class is in ninety per cent of undergraduate classes an unmitigated bore. The student who writes the report gains much, but this gain may all be conserved by (1) depositing his report in the library and requiring each student of the class to read a certain percentage of such reports and write a criticism of one or more of them; and (2) fifteen minutes' conference with

[1] Of course I leave out of question tasks which do not involve the probability of several students wishing to use the book at the same time.

the instructor in friendly discussion of the report. Report reading is now in great vogue in college classes, but I am sure that it is a fetich, a most unfortunate legacy of the seminar.

Sixth: by systematic encouragement of the natural tendency of students to coöperate in study the entire work of the course may be made more cheerful and easy.

There are other matters concerning method which I should like to have discussed by the Association, but they are probably not of sufficient interest or importance to most of us.

I have, finally, one or two practical suggestions. Perhaps teachers of educational psychology throughout the country would welcome an expression of opinion from experts concerning the fifty or more books on pure and applied psychology that are now used as text-books. A committee of this Association might well report upon the characteristics of books on pure psychology which are or might be used in courses preliminary to a course for teachers. The American Psychological Association would, I am sure, find a thoroughly capable committee who would be willing to report upon books on educational psychology from the point of view of the scientific expert. Such committees should not recommend specific books or a specific course, but should indicate the quality of each book in somewhat the manner of the report of the New England History Teachers Association upon text-books in history.

It might be wiser for a joint committee to report on both the utility and the scientific quality of both sorts of books, but it would be hard for so large a committee to work efficiently; the labor would be quadrupled; and the increase in authoritative advice would not be great. We can easily tell how usable a text-book on educational psychology is by using it, and we have no trouble in estimating the scientific value of a text-book on general psychology by the personality and position of its author.

Such reports could be published without expense in the proper educational and psychological journals, and reprints could be distributed to all teachers of psychology in colleges and normal schools at a cost not to exceed thirty dollars.

OUTLINE OF A YEAR'S COURSE IN GENERAL AND EDUCATIONAL PSYCHOLOGY

The course at Teachers College represents one fifth of a student's work during the year. The course is carried on in three periods a week, plus one period for special assistance, consultation, and the like, which is voluntary on the part of the student. Two periods are spent in sectional meetings, the class being divided into as many sections as the necessities of economy will allow. These meetings are given up to rather free discussion, to questioning of the instructor by students and of students by the instructor, and the like. In one meeting the entire class comes together for lectures, demonstrations, announcements of work, and the like. The work of the entire course is divided approximately as follows: three sevenths of the time is given to a study of those aspects of general psychology which are most important for intending teachers and students of education; three sevenths to a study of the actual scientific knowledge possessed concerning the process of teaching, and the probable inferences to be drawn from psychology and child study concerning the problems of teaching and class management; one seventh to a study of the general relations between psychology and education, the psychological basis of general educational theory, and the application of scientific method to school problems. We try to so arrange the course that the student has always some definite work to do in addition to the mere reading of text-books and special articles. In general psychology, for instance, each student performs thirty simple experiments and solves some three hundred simple problems and exercises which test, apply, and to some extent increase the knowledge which he gains from books, demonstrations, and occasional lectures. Samples of these will be quoted later. In educational psychology the student himself makes the connection between the facts of science and the probably best means of procedure in the art of teaching by answering similar problems and doing similar exercises. Up to the present year the students have also done extensive observational work in the class-rooms of elementary and secondary schools. The size of our class, now over two hundred, and the exigencies of a program of studies so rich in electives that there is never a single hour

even of the week when the class as a total is free from other engagements, is compelling a reorganization of this work.

Outlines of courses are unsatisfactory unless they are so long as to give the actual details of the subject-matter of the course and the actual methods of conducting every aspect of the work. To do this is obviously impossible in this place, and I should not have made the outline which follows but for the fact that the officers of the association thought it desirable to have something more concrete for purposes of discussion than a general article. What we actually need for our practice, I am convinced, is not so much schematic outlines as a concrete fund of particular suggestions concerning experiments, observations, questions, and the like, and a wide variety of text-books on educational psychology from which the useful may be gradually selected for survival.

OUTLINE OF TOPICS IN GENERAL PSYCHOLOGY

I. The subject-matter and problems of psychology
   1. Introduction
   2. A general view of mental states
   3. A general view of human action
   4. A general view of the connections of mental facts

A.—*Descriptive Psychology*

II. Feelings of things and qualities as present: sensations and percepts
   5. The nature of sensations
   6. The classification of sensations
   7. Sensation and stimulus
   8. Percepts

III. Feelings of things as absent: images and memories
   9. Mental images
   10. Memories

IV. Feelings of facts: feelings of relationships, meanings, and judgments
   11. Feelings of relationships
   12. Feelings of meanings
   13. Judgments

V. Feelings of personal condition: emotions

14. The nature of the emotions
15. The classification of the emotions
16. The attributes of the emotions

VI. Mental states concerned in the direction of conduct: feelings of willing

17. Definitions and descriptions

VII. General characteristics of mental states

18. Qualities common to all mental states
19. Attention
20. A new classification of mental states

VIII. The functions of mental states

21. The function of mental life as a whole
22. The functions of different groups of mental states

B.—*The Physiological Basis of Mental Life: Physiological Psychology*

IX. The constitution of the nervous system

23. Gross structure
24. Finer structure

X. The action of the nervous system

25. The functions of the neurones
26. The arrangement of the neurones
27. The laws of brain action

XI. The nervous system and mental states

28. In general
29. The physiological correlates of particular groups of mental states

C.—*Dynamic Psychology*

30. Introduction

XII. Original tendencies to connections

31. Instincts
32. Capacities
33. Further attributes of original tendencies

XIII. The law of association

34. The growth of instincts into habits
35. The formation of connections in general
36. The control of the formation of connections
37. Response by analogy

XIV. The law of dissociation or analysis

38. The process of analysis
39. The influence of the law of analysis
40. The control of the process of analysis
41. Physiological conditions of human nature

XV. The connections between sense stimuli and mental states: connections of impression

42. Inborn and acquired connections of impression
43. The law of association in the case of connections of impression
44. The control of connections of impression

XVI. The connections between one mental state and another: purely mental connections

45. Associations of ideas
46. Memory
47. The control of purely mental connections

XVII. The connections between one mental state and another (continued)

48. Purposive thinking
49. Reasoning

XVIII. The connections between mental states and acts: connections of impression

50. The general laws of human action
51. The will. Spontaneous and purposive action
52. The nature of the mental states which precede movements
53. Suggestion and imitation
54. Individual differences in the life of action
55. The control of the life of action

XIX. Movements

56. Acts of skill
57. The connections between stimuli and movements
58. Movements as antecedents

XX. Selective processes

59. Attention and neglect
60. Satisfaction and discomfort
61. Conclusion

XXI. The relations of psychology

62. The science of psychology as a whole
63. The relations of psychology to other sciences
64. The relations of psychology to the arts

65. The relations of psychology to the personal conduct of life

The above topics are studied by the students through a text-book, certain required readings, and certain printed or mimeographed notes. The following may serve as samples of the questions, exercises, and experiments by which we try to preserve the student from vague and verbal notions, and to make his work outside the class-room as profitable as possible.

Exercises (to go with XII of the outline above)

1. Pugnacity, climbing, walking, emulation, jealousy, biting the finger nails, curiosity, and manipulation or constructiveness are commonly quoted cases of instinctive tendencies. What are the situations and the responses, the connections of which constitute these several instincts? *E. g.*, pugnacity means the response "blows" to the situation "being injured or interfered with," and the response "enjoyment" to the situation "fighting."

2. Of the instincts mentioned in question 1, name one that is delayed, one that is transitory, one that is common to man and the lower animals, one that is the most characteristic of the male sex, one that is most useful, one that is often the origin of criminal acts.

3. Give two illustrations from history or from your own acquaintance of a high degree of capacity coupled with only moderate attainments in other directions.

4. Just how would you get rid of the tendency in a child to torment animals? After writing your answer read again the last page of the reference and note which methods of those mentioned there your plan involves.

5. Which is rarer, the capacity to form percepts or the capacity to form abstract ideas?

6. Illustrate individual differences (a) in the case of sensation, and (b) in the case of imagery.

7. Illustrate race heredity, *i. e.*, the inheritance of certain mental qualities by a race as a whole.

Experiment 16. Instincts of the Reflex Type.—Have a friend hold about half or three quarters of an inch in front of his eyes, a piece of glass at least an eighth of an inch thick. Throw

directly at his eye a bit of cork or light wood, or a small wad of paper, so aimed that, but for the glass, it would hit the eye and at a fair rate of speed. Of course he winks. Then inform him that you will repeat the process, and that since it is impossible that anything can hit his eye he is to keep it wide open. Throw as before. Is the eye kept open? Repeat nine times more, noting and recording each time the action of the eyelids.

Experiment 17. The Modifiability of Instincts.—With sufficient time the instinctive closing of the eye can be modified and even inhibited. The experiment may take many trials. If it is made, a tube like a pea-shooter, but one half inch in diameter and not over eight inches long, and a sufficient number of bits of cork about a quarter of an inch in diameter, should be provided. Record the action of the eyelids at each trial, and continue the experiment until the person can hold the eyelids unmoved during ten successive trials.

Exercises (to go with XV of the outline above)

1. Read again the references on II and recall the results of the experiments there described. [These showed that the same sense stimulus was felt in different ways according to the previous experience of the perceiving mind.]

2. Illustrate individual differences in the capacities to feel things and qualities in response to sensory stimuli.

3. Illustrate individual differences in perception due to differences in previous experience.

4. Illustrate the law of diminishing returns in the case of the perception of movements. Of tastes.

5. Classify the following illusions as (*a*) those caused by the strength of previous habits and (*b*) those caused by the temporary set of the mind.

"An officer who superintended the exhuming of a coffin rendered necessary through a suspicion of crime declared that he already experienced the odor of decomposition, though it was afterwards found that the coffin was empty." (Quoted from Carpenter's *Mental Physiology* by J. Sully in *Illusions*, p. 108.)

"I never feel sure after wiping the blades of my skates, that they are perfectly dry, since they always seem more or less damp to my hand." (Sully.)

If we are seated in a railway train which is quite stationary, and watch through the window a train passing ours on a neighboring track, we feel our own train to be in motion in the opposite direction.

"I remember one night in Boston, whilst waiting for a 'Mount Auburn' car to bring me to Cambridge, reading most distinctly that name upon the signboard of a car on which (as I afterward learned) North Avenue was painted." (James.)

6. What are the connections of impression formed in learning to read?

7. What is really trained in the so-called "training of the senses"?

Experiment 18. Hold one hand in hot and the other in cold water for a few seconds, then immerse both in the same dish of tepid water. Compare the feelings of the two hands.

Experiment 19. Color Contrast.—Take five pieces of the same gray paper. Lay them on sheets of white, black, red, green, and blue paper. Cover with very thin tissue paper. Compare the five grays.

Take two pieces of the same green paper. Lay one on a red background, the other on a background of its own color. Cover as before and compare the two greens. Do similarly with red on a green and on a red background.

Experiment 20. The Law of Diminishing Returns.—On a sheet of paper 10 inches or more wide rule five lines 20, 40, 60, 80, and 100 millimeters long respectively. Place beside it a similar sheet and draw lines as nearly equal to the models as you can without measuring or superposition. Do the same thing with another sheet, and continue until you have ten sheets, each with five lines as nearly equal to the original models as you can draw them. Find, by measuring, the error made in each of the fifty lines. Compare the amount of the error for the 20 mm. line with that for the 40 mm. line and so on through the series.

Experiment 21. The Law of Association in Perception.—Print in the same style and size each of the following words upon a slip of paper and paste on a card $3\frac{1}{2}$ by $1\frac{1}{2}$ inches: (1) good, (2) boy, (3) house, (4) pasent, (5) scarf, (6) sdirt, (7) chip on, (8) feather, (9) tackle, (10) tooch drwn, (11) genuine, (12) meawing, (13) reaeoning, (14) initate, (15) stoie, (16) morning, (17) frequmtly, (18) constant, (19) embrarderg.

Expose each (in the order given above) for one or two fifths of a second to some one unacquainted entirely with the cards or the object of the experiment and have him write down what he sees in each case. Explain so far as you can the percepts felt. Compare the records of men and women in the case of words 6, 7, 9, 10, 15, and 19.

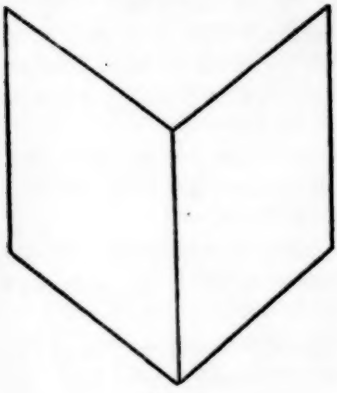

FIG. 78.

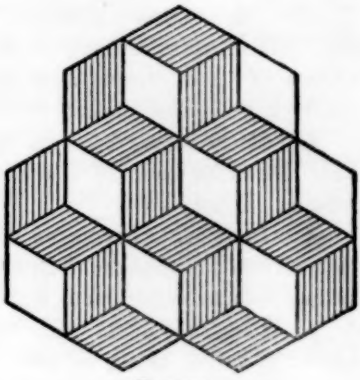

FIG. 79.

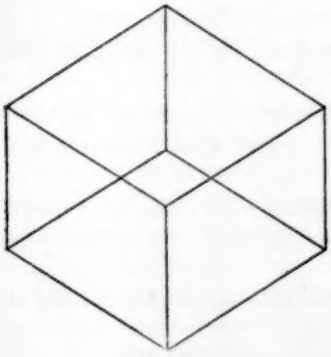

FIG. 80.

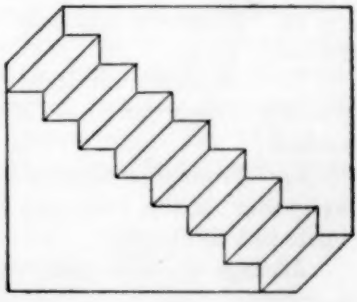

FIG. 81.

Experiment 22. Look at Fig. 78. Does it seem to be (1) a folded sheet with the folded edge toward you, or (2) a folded sheet with the folded edge away from you, or (3) a group of lines on a flat surface? Continue looking at it steadily. What happens? Make it seem like (1) (without altering the figure itself at all). Make it seem like (2). What do you do to make it seem

like (1)? Shut your eyes; imagine a sheet of card-board with the folded edge away from you, open your eyes and look at the figure. Which was it like, (1), (2), or (3)? Make it seem like (3). Which appearance is hardest to obtain, (1), (2), or (3)?

Experiment 23. (*a*) How many blocks are there in Fig. 79? Continue looking at it steadily. What happens?

(*b*) How many different appearances can you get from Fig. 80? Describe each of them. Why does it seem like an object of three dimensions rather than of two only, when it really is all in one plane?

(*c*) How many different appearances can you get from Fig. 81? Describe each of them. Which is the easiest to get and retain? Why?

8. In what other experiments have you found the alternation of one impression with another in somewhat the same way as happens in experiment 23?

9. Illustrate from your record of experiment 22 the statement: "What thing is perceived will depend upon past experience."

10. Illustrate similarly: "What thing is perceived will depend upon the state of mind at the time of perceiving."

11. Illustrate similarly: "Perception is of definite and probable things."

12. Illustrate similarly the influence of frequency of connection in determining what percept a given sense stimulus will arouse.

13. From your records of experiments 18, 19, 20, 21, 22, and 23 gather all the facts you can in support of any statements made in this chapter.

Arrange these in lists, each under the statement which it supports.

OUTLINE OF TOPICS IN EDUCATIONAL PSYCHOLOGY

I. The science of psychology as a basis for the art of teaching. The limitations due to individual differences in children, to the conditions of class teaching, to the personality of the teacher, and to conflicting forces outside the school.

II. Means for receiving stimuli and responding to them.
The sense organs.
Motor apparatus.
The connecting apparatus.

III. The applications to teaching and class management of the psychology of attention.

IV. The applications to teaching and class management of the psychology of instincts.

V. The applications to teaching and class management of the psychology of capacities.

VI. The applications to teaching and class management of the psychology of the law of association.

VII. The applications to teaching and class management of the psychology of the law of analysis.

VIII. The applications to teaching and class management of the psychology of connections of impression.

IX. The applications to teaching and class management of the psychology of connections of association.

X. The applications to teaching and class management of the psychology of connections of expression.

XI. The applications to teaching and class management of the psychology of imagery.

XII. The applications to teaching and class management of the psychology of the emotions.

In case of topics III to XII, direct application is made by the student of the facts obtained in general psychology under topics III–VIII and XII–XX, together with related facts drawn from child study.

XIII. Interests.

XIV. Mental training.

XV. Incentives and deterrents.

XVI. The correlation of studies.

XVII. The relation of physical well-being to successful class work.

XVIII. A review of the advantages and disadvantages of typical features of general method, such as developing questions, motor expression, inductive approach, and the like.

XIX. The study of text-books and lesson plans from the point of view of educational psychology.

XX. The study of typical special methods from the point of view of educational psychology.

Exercises (to go with part of IX of the outline)

References: Review the work of XVII, 48, and 49, of the syllabus in general psychology and read chapters VI–VIII of McMurry's *Method of the Recitation* and sections 11–13 of Thorndike's *Notes on Child Study.*

1. Which kinds of mental states are especially necessary in reasoning?

2. Why is it so often more useful for one element or feature of a fact to call up the next thought than for the total fact to do so?

3. What means would you take to secure such partial activity of a fact in a pupil's mind?

4. What means would you take to secure the activity of the right or essential part?

5. What is the result of the comparison of facts?

6. What devices would you use to make comparison easy in teaching tense? In teaching the principle of the balance? In teaching the order of the sentence in German?

7. When the right element or aspect of a fact is selected, what more is necessary to secure the right conclusion?

8. Illustrate failures in reasoning in geometry, in grammar, and in geography due to the absence of knowledge—the absence that is, of certain facts or connections between facts.

9. What are the differences between inductive reasoning and deductive reasoning? What are their resemblances?

10. What would be an inductive method of teaching a class to understand the meaning of "noun" and "verb"; that four threes make twelve; of teaching French or Latin; of teaching that the three angles of a triangle are equal to two right angles; that -9 times -3 gives $+27$?

11. Which of the above would you think more properly taught deductively?

12. Name a school subject which begins with and continues with general and abstract notions.

13. Name a school subject which deals almost exclusively with individual facts.

14. What would be a deductive method of teaching French or Latin?

15. What grammar school subjects involve most deductive reasoning?

16. What high school subjects?

17. Illustrate the following statement in the case of teaching "voice" in English grammar, or the acid-base reaction in chemistry, or the first steps in the multiplication of fractions:

Good teaching by inductive methods depends upon a clear statement of the goal aimed at, the selection of enough and representative individual facts, their arrangement in such a way as to make the general idea or judgment they lead to obvious, and the reinforcement and clarification of the general idea or judgment, when obtained, by applying it to new individual facts.

18. Illustrate the following statement in the case of teaching a proposition in geometry, or the parsing of a sentence, or the deposition of soil by flowing water:

Good teaching by deductive methods depends upon a clear statement of the goal aimed at, independent search by pupils for the proper class under which to think of the thing in question, criticism by them and by the teacher of the different classes suggested, and appreciation of the reasons why the right one is the right one.

The psychology of the processes, other than correct induction and deduction, on which the accurate feelings of meanings and judgments and the adroit inferences that constitute comprehension depend, is not well worked out, and we can only apply certain rather vague principles.

19. Could a person reason well or follow intelligently a train of reasoning about a class of objects if his knowledge of the individual members of the class were imperfect?

20. Could a person comprehend statements about a quality, say bivalence, if he did not know the essentials of that quality?

21. Would he comprehend the answer to a question better if he were first made to realize the question? Why?

22. If the habit of comparing things and the ability to see the essential elements in a thing and ready knowledge of the properties of these elements are the characteristics of the good reasoner, what sort of teaching would make students reason well?

23. In which case would a student be the more likely to comprehend a theory or argument: if he had his knowledge in the form of images, for instance of a leaf of certain shape, or if he had it in the form of a judgment that the leaf was of that shape?

24. Which of the qualities of teaching that are efficacious in gaining attention are also efficacious in gaining comprehension?

25. Should one example or many be given with a definition? Why?

26. If all judgments refer eventually to real objects, will it be generally safe to trust that judgments can be comprehended without actual demonstrations, experiments, and object lessons?

The processes by which people think things out often cannot be followed at all. To some people the right idea simply comes, they know not whence or how. We say that such possess tact or scientific insight or instinctive business ability or what not, but we cannot give their rationale.

To all outside appearances such people simply guess, but they guess right. The essential element is picked out automatically. The idea that comes without any rational procedure is still the one that fits the situation.

27. If you defined this general feeling for the truth of things as the power to guess right, how would you try to cultivate it in a scholar?

28. Do teachers customarily encourage children to guess?

29. When has any one a right to guess?

We have already seen that knowledge in the form of definite judgments is superior to knowledge in the form of hazy images, that recalling ideas from within is better than repeatedly receiving them from outside, that we test and increase our comprehension of a matter by applying it ourselves. All these things point to the fact that the expression of our ideas clarifies and renders permanent our knowledge. Moreover, knowledge is eventually of value only as expressed.

30. Why?

31. What other means of expression should the teacher secure besides words?

32. How may examinations be made useful means of expression on the part of pupils?

33. Can a pupil express his feelings by silence?

34. What facts cannot be truly expressed in pictures, models, or the like?

35. Clearness, vividness, accuracy, completeness, convenience, economy of time, and permanent effect are the qualities desirable in any means of expression. Which of them are possessed in high degree by drawings? By models made? By schematic diagrams? By spoken words? By gestures? By written words?

36. Triviality, waste of time, absorption in technique, vagueness, and meaninglessness are the qualities to be avoided in any means of expression. To which of these is expression in words liable? Expression in drawings and models? Suggest means of avoiding them.

References: Review the work of XVI, 46, and 47 of the outline of general psychology.

In order to be fruitful, what we teach must not only be attended to, appreciated, and understood, but also be made the pupil's permanent property. No apology is needed for the teacher who gives much thought to the best ways of aiding her scholars to remember. This is especially true if we bear in mind that memory is a wider function than mere verbatim knowledge, and includes permanent appreciation of the meanings of terms, of general facts and tendencies and laws.

There are three common ways of memorizing, by repetition, concentration, and recall. 1. Which is the one commonly used by children? 2. Which is the one commonly advocated by teachers? 3. Which is the best? Why?

Ebbinghaus found that it took sixteen repetitions to learn a series of twelve nonsense syllables, and fifty-five repetitions to learn a series of twenty-six. 4. What suggestion would you get from this concerning memorizing poems, model sentences, quotations, etc.?

Miss Aiken found that a poem could be best learned by learning a skeleton of the leading words, verbs, etc. 5. What suggestion would you get from this concerning learning about a period in history or a topic in geography?

Pupils often can recite a multiplication table glibly, and yet be slow and inaccurate in answering any one question, *e. g.*, how much is 7 times 9; they often can conjugate a Latin verb through glibly, and yet fail to translate readily any given form.

6. What suggestion would you get from this concerning the nature of the associations to be formed in learning tables, grammatical forms, and such things? 7. How would you apply the same facts to learning spelling?

The secret of remembering things is having them associated firmly with those things in connection with which they will later be wanted. 8. How would a systematic arrangement of subject-matter help pupils to remember it? 9. How would cross-references help?

In learning lists, the order of points of a discourse, etc., arbitrary devices of associating the different elements with other things are often helpful. 10. Which ones have you ever used? 11. Which seem the most useful?

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I. The general problems of education
   - The processes of changes in human nature
   - Aims of changes in human nature
   - Material of changes in human nature
   - Means of changes in human nature
   - Methods of changes in human nature

II. Knowledge of human nature
   - From physiology
   - From psychology
   - From sociology

III. The problems of educational psychology
   - Those of the theoretical student of education
   - Those of the administrator and teacher

IV. Contributions of educational psychology
   - Knowledge of general facts and laws of human nature, provided by general psychology, especially dynamic psychology
   - Knowledge of mental growth and the facts of children's minds, provided by child psychology
   - Knowledge of individual make-ups, of deviations from the type, provided by individual psychology

V. The influence of original nature and heredity

VI. The environment as a formative agency

VII. The influence of special training on general abilities
VIII. The influence of the environment as a selective agency
IX. Individual differences in mental traits
X. The special psychology of the elementary school age
XI. Adolescence
XII. Methods of study in education
    Observation
    Experiment
    Comparison
XIII. Aids to observation. The criteria of a scientific observation
XIV. Experiment in education
    Advantages
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